Organic jan 13

Monday, 11 October 2021 17:08

AROMATICITY

Cyclic Compounds

Aromatic (A) → Burns with Sooty flames → don't show addⁿ Rxⁿ.

Anti-Aromatic (AA) → Involves ABMO

Non-Aromatic (N.A)

Aromatic ⇓ Compound
- ↳ planar (sp/sp^2 → all atoms)
- ↳ Delocalisation of $(4n+2)\pi e^-$s

Reson ⇒ or Resonance of $(4n+2)\pi e^-$ in Complete cycle

n=0, 1, 2 - - -

n=0, 2πe⁻s
n=1, 6πe⁻s
n=2, 10πe⁻s
n=3, 14πe⁻
n=4, 18πe⁻
n=5, 22πe⁻

Anti-Aromatic
- ↳ planar
- ↳ Delocalisatⁿ of 4nπe⁻

Reso ⇓ or Resonance of 4nπe⁻s in complete Ring

⇓ Huckel's Rule of e⁻ delocalisation

n=1, 4πe⁻
n=2, 8πe⁻
n=3, 12πe⁻
n=4, 16πe⁻
n=5, 20πe⁻
n=6, 24πe⁻

Non-Aromatic ↳ Either any atom in Ring is sp^3 or atoms of Ring are not in 1 plane i.e; Comp is not Planar.

Stability Aro > N.A > A.A

Energy or Reactivity Aro < NA << AA

$C_{20}H_{20}^{2+}$ → 18πe⁻ Aro

C_nH_n ⇒ no. of πe⁻ delocalised = n → [n]-Annulene
$C_nH_n^{+2}$ ⇒ πe⁻s ⇒ (n−2)
$C_nH_n^{-2}$ ⇒ πe⁻s ⇒ (n+2)

C_6H_6 ↳ [6]-Annulene

$C_4H_4^{2+}$ ↳ 2πe⁻ Aro

$C_{18}H_{18}^{2-}$ ⇓ 20πe⁻ ⇓ A·A

Understand the Aromaticity for following Compounds :-

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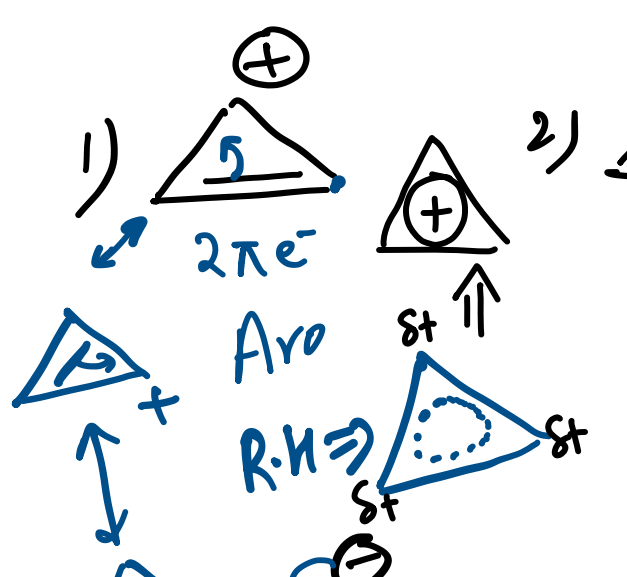

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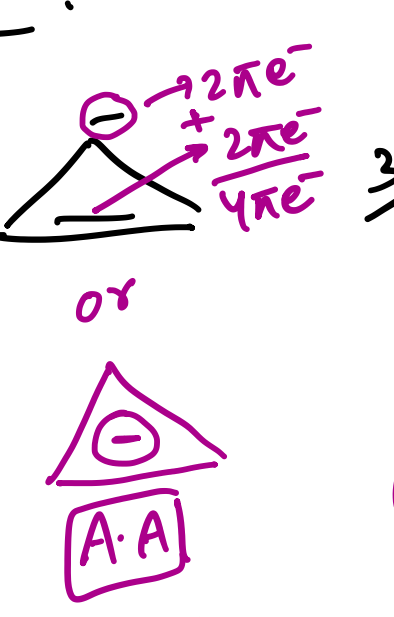

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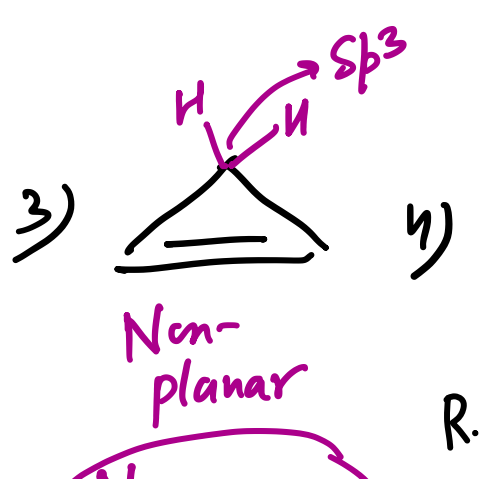

Non-planar

Non-Aromatic

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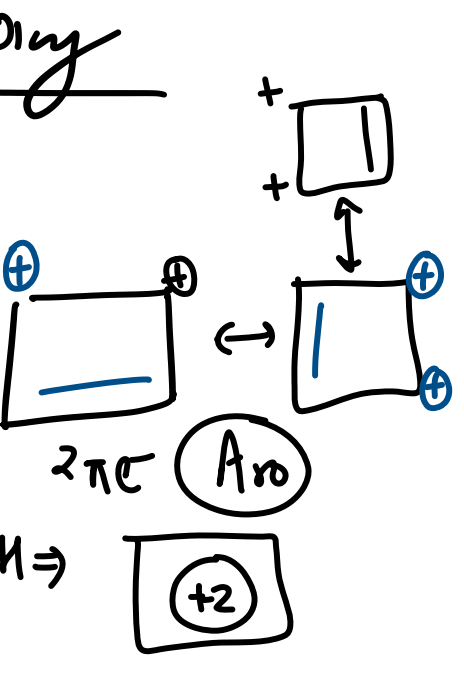
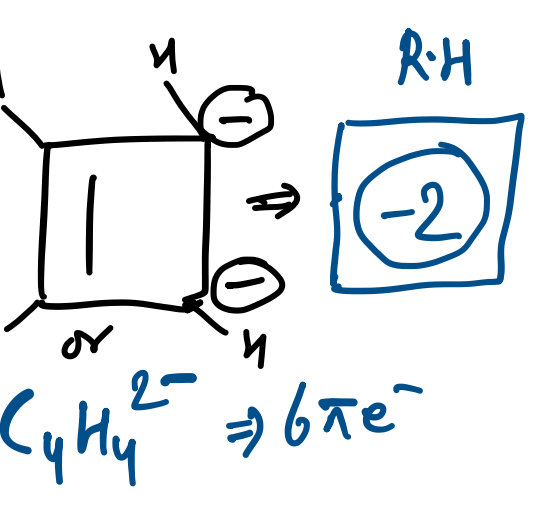
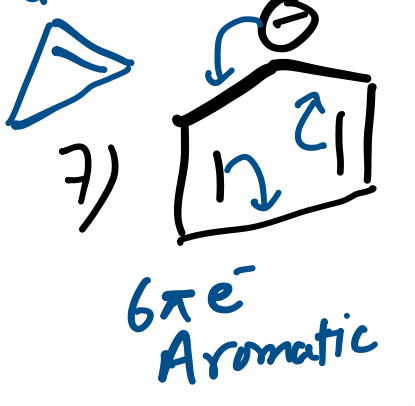


Aro

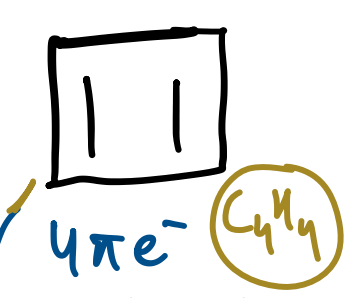
5)


$C_4H_4^{2-}$ ⇒ 6πe⁻ Aromatic

7)


$C_5H_5^{\ominus}$ Cyclopentadienyl anion

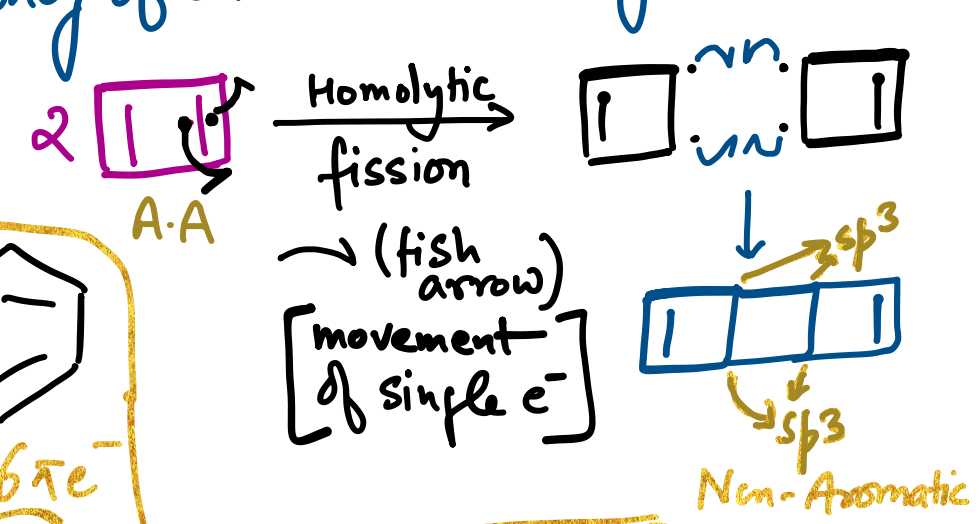
6πe⁻ Aromatic

6)


4πe⁻ A.A

C_4H_4 or [4]→Annulene

This Comp. have High tendency of dimerisation. why?

Reason:-


A·A → N·A Stability ↑

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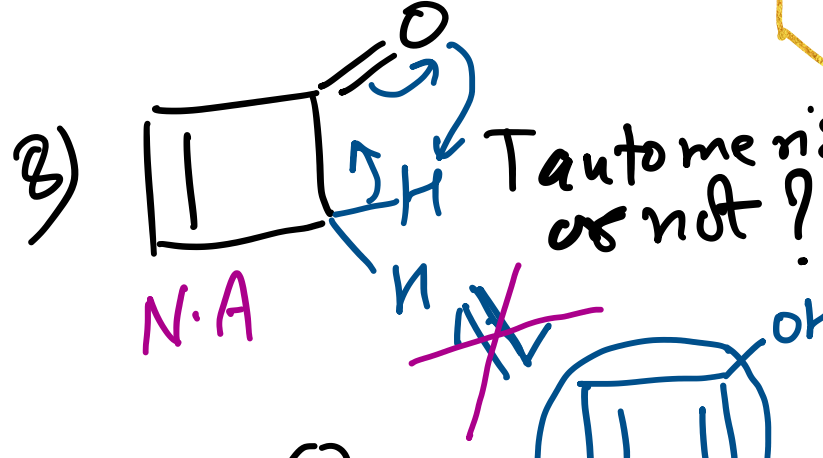

N·A

Tautomerise or not?

A·A

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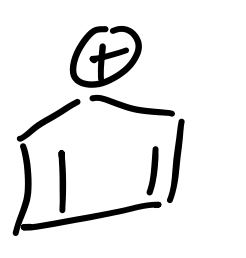
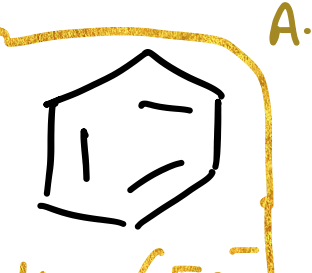
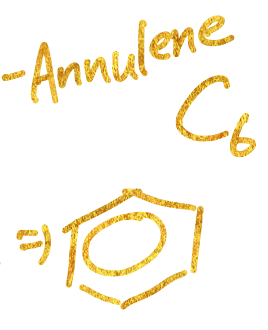


A·A

10)


[6]-Annulene C_6H_6 6πe⁻ Aro

R.H ⇒


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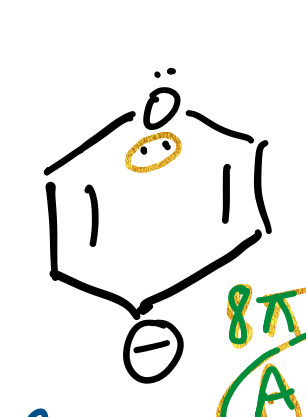

8πe⁻ A.A

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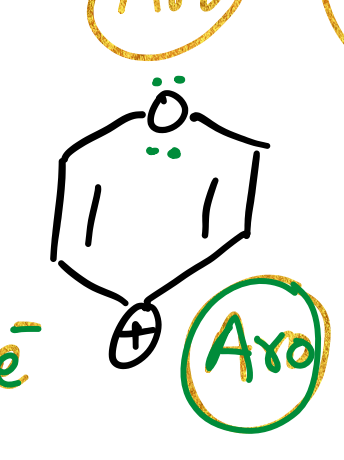

6πe⁻ Aro

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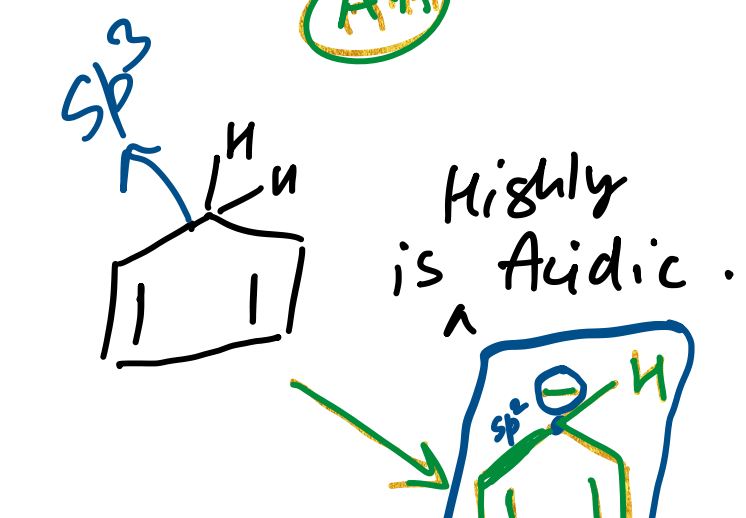

Highly is Acidic. why?

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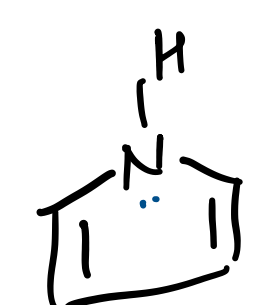
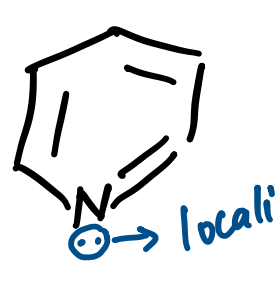


6πe⁻, Aro

15)


6πe⁻ → localised

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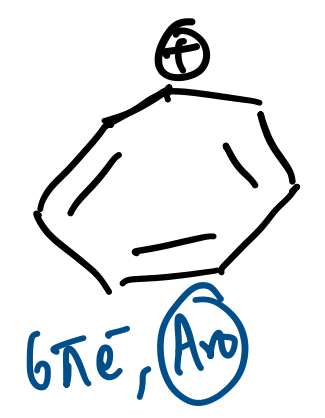

6πe⁻, Aro

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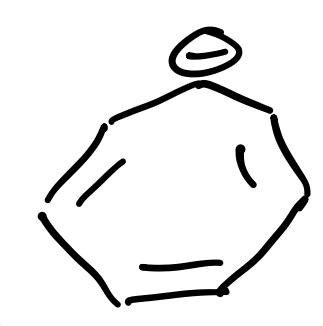
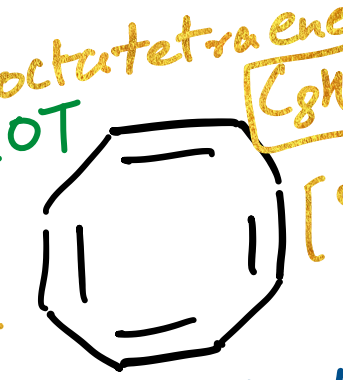


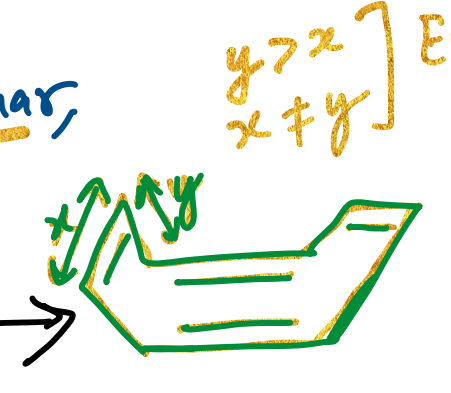
A.A 8πe⁻

18)


Cyclooctatetraene COT C_8H_8 [8]-Annulene

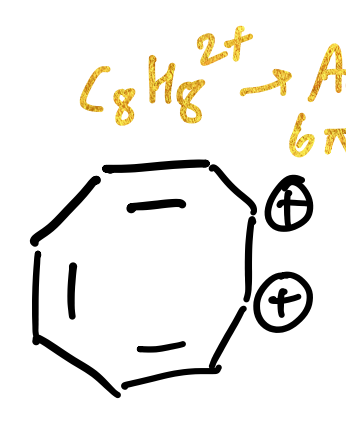
8πe⁻ → should be anti-Aro. But it is non-planar, So, non-aromatic.

Exist as Boat shape or Puckered structure

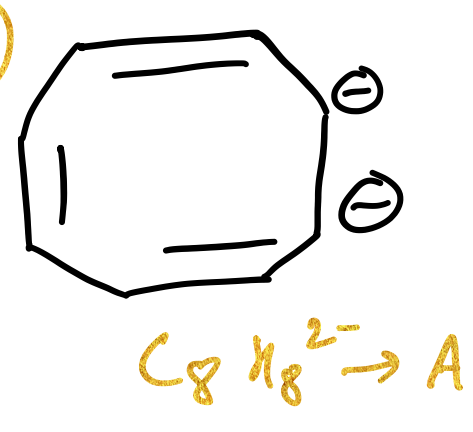


y>x, x≠y Evidence

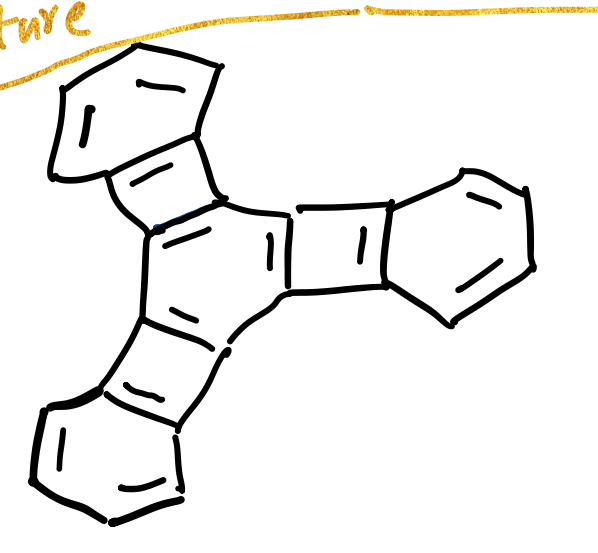
Resonance is not in complete Ring.

19)


$C_8H_8^{2+}$ → Aro 6πe⁻

20)


$C_8H_8^{2-}$ → Aro 10πe⁻

21) H.W


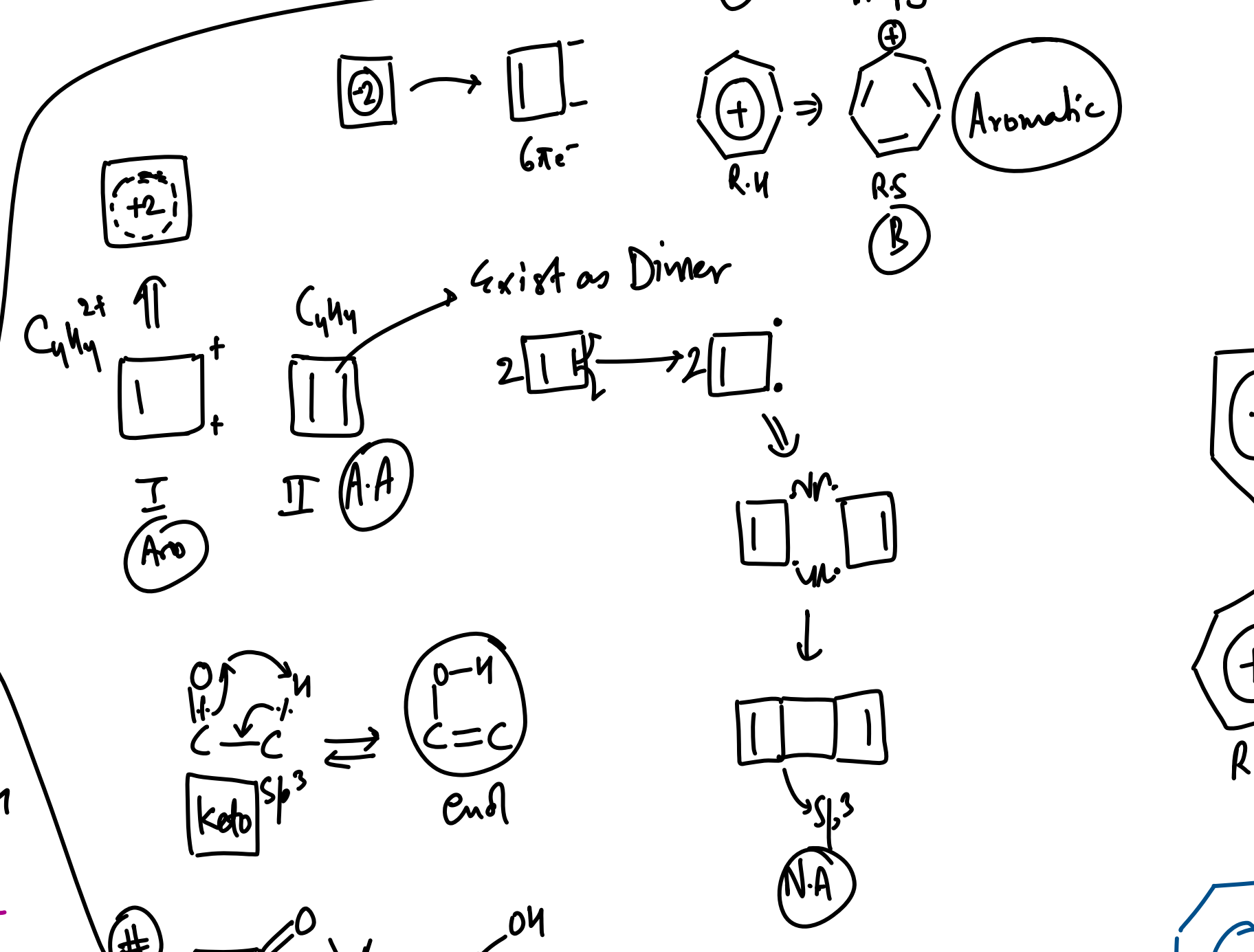
$\xrightarrow[\text{of } H_2]{\text{3 moles}}$ Which Ring is Hydrogenated?

* In Aromatic cpds → Bonding M.Os are involved.

→ more delocalisation of πe⁻s, more will be stability, Compound exist with small energy.

* In Anti-aromatic cpds

↳ Here anti-bonding Molecular orbitals are involved in delocalisation i.e, E ↑es & stability ↓es due to delocalisatⁿ of 4nπe⁻s.



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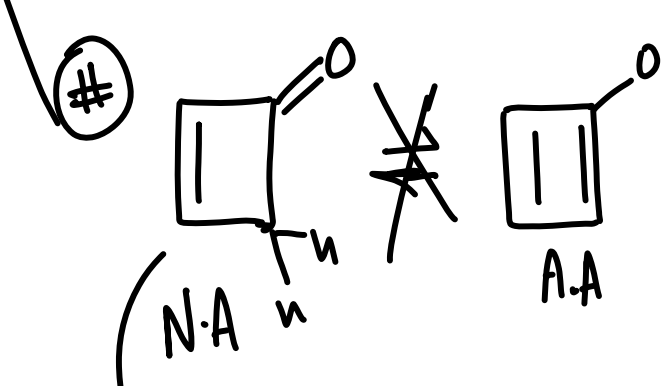

N.A doesn't Tautomerise

A.A

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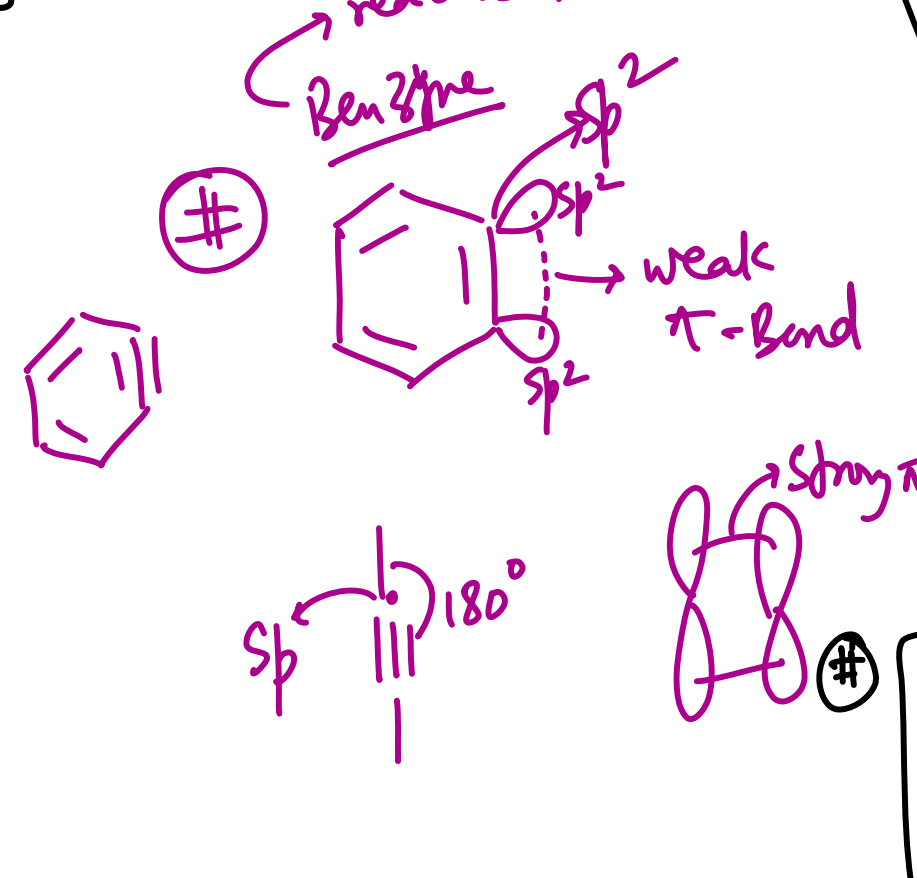

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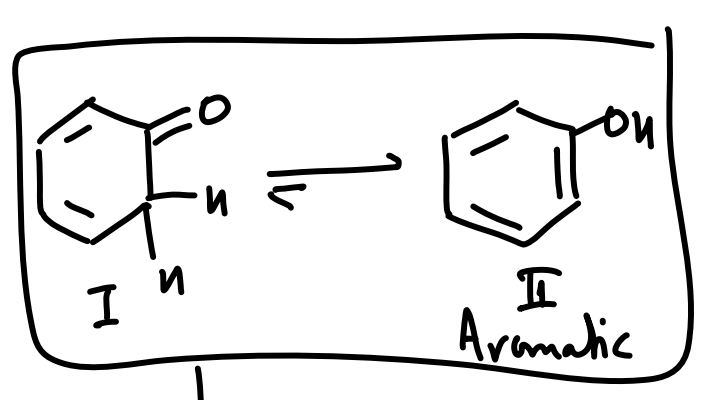
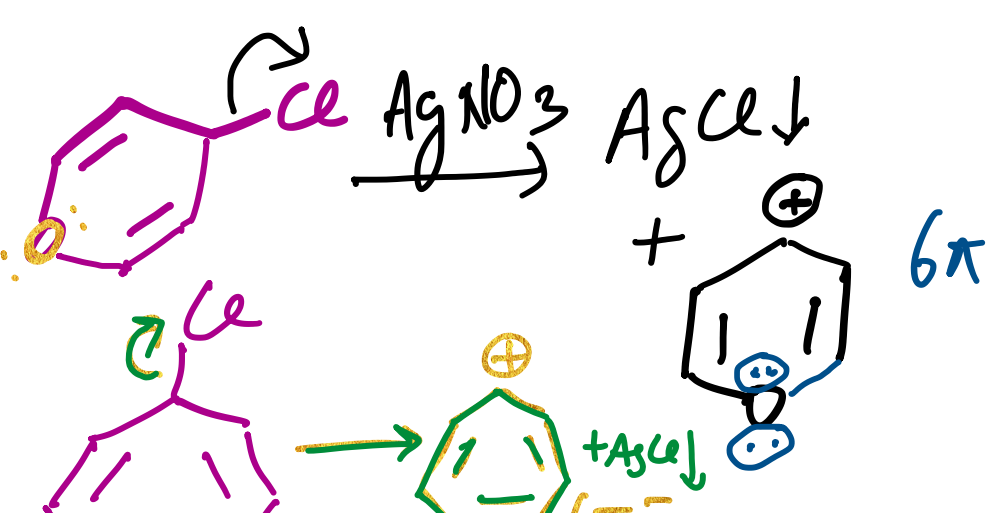


Eqᵐ Mix Contains more than 99% of II & less than 1% of I

Q. $AgNO_3$ on Rxⁿ with Comp. A donot form AgCl ppt. A?

1)


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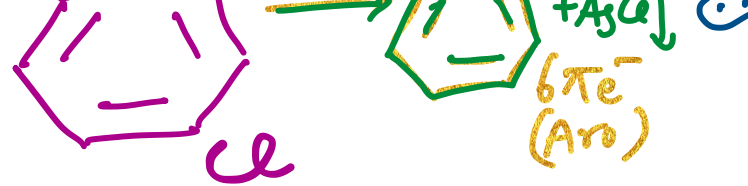

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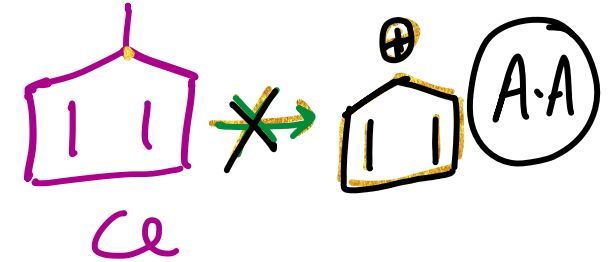

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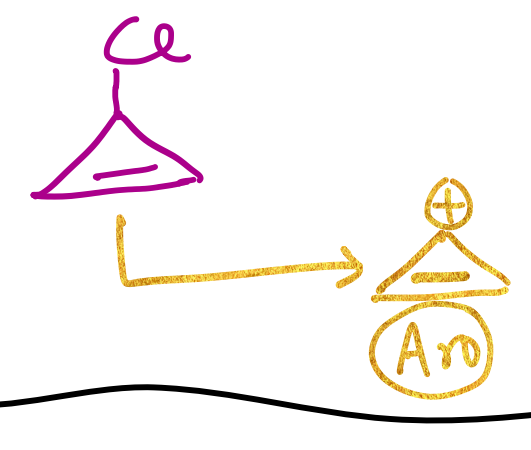
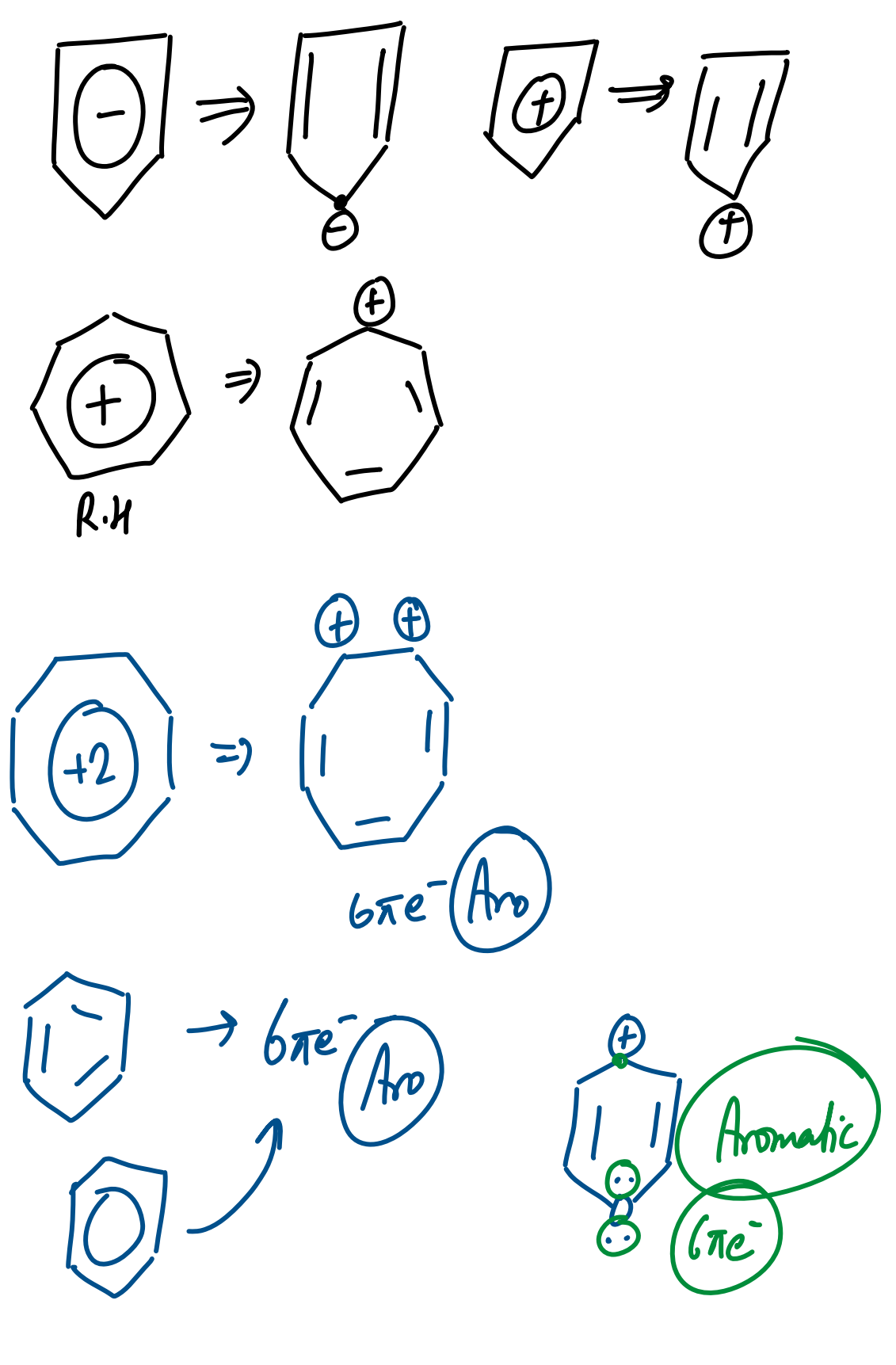


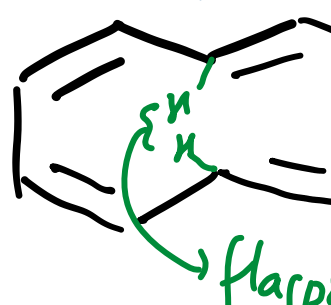


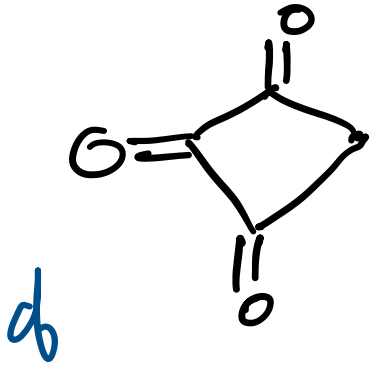
22) $C_4H_4^{2-}$ 6πe⁻ Aro

23) $C_{20}H_{20}^{2-}$ Aro 22πe⁻

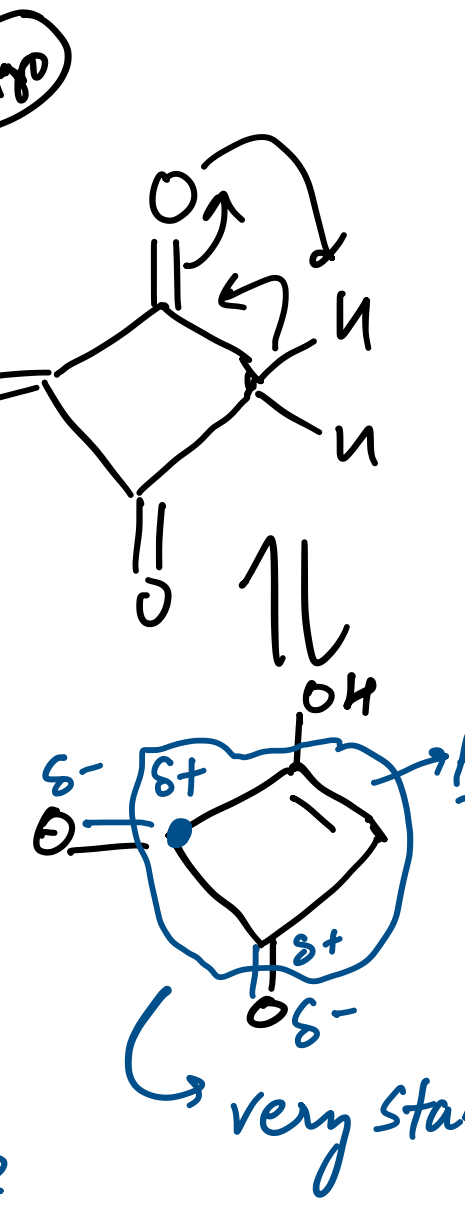
24) $C_{20}H_{20}^{2+}$ 18πe⁻ Aro

25) [10]-Annulene $C_{10}H_{10}$ ⇓ 10πe⁻ → Shud be Aro. But it is non-Aro. Because of Non-planar



26) enol form of


is very Stable. why?



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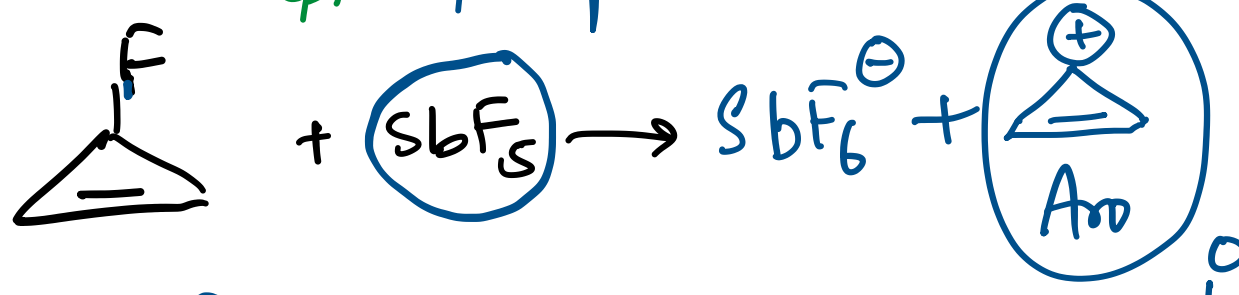

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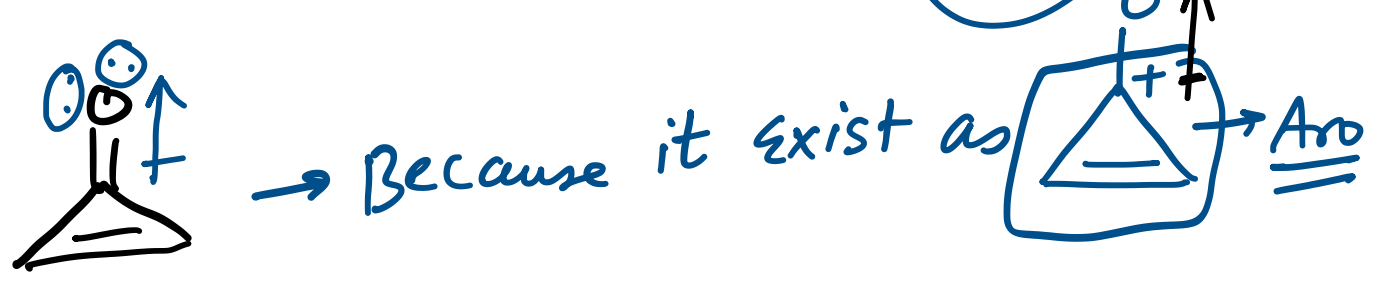
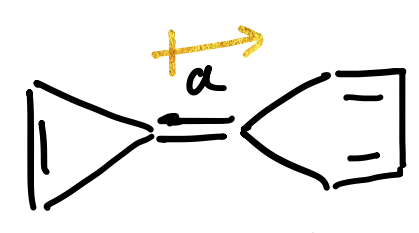
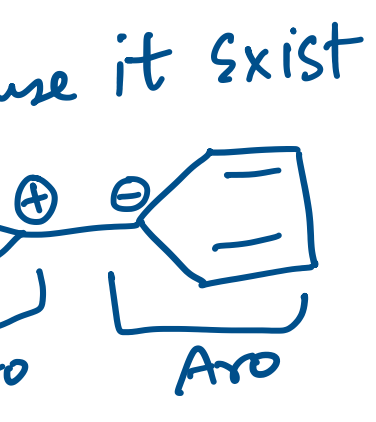


(Y) ↳ Have permanent High dipole moment. Explain.

29)


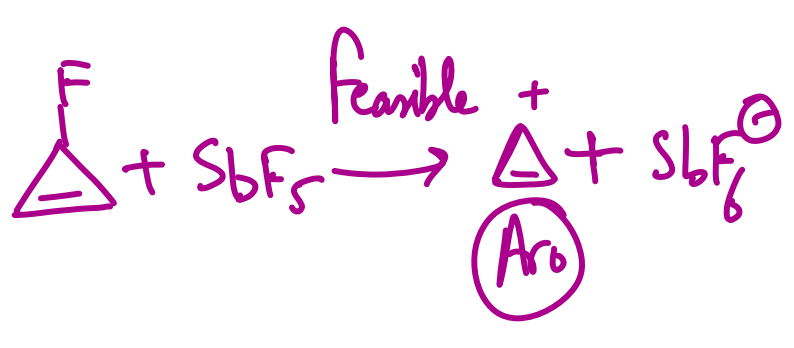
Comp. having High dipole moment, energy barrier for rotation around bond 'a' is very less – Explain?

Because it exist as


Note- Halide ion Capturing Compounds (Lewis Acid)

L.Acid
$AlCl_3 + Cl^- \rightarrow AlCl_4^-$
$BF_3 + F^- \rightarrow BF_4^{\ominus}$
$SbF_5 + F^- \rightarrow SbF_6^-$
$PCl_5 + Cl^- \rightarrow PCl_6^-$
$SiF_4 + 2F^- \rightarrow SiF_6^{2-}$
$FeCl_3 + Cl^- \rightarrow FeCl_4^-$
$FeBr_3 + Br^- \rightarrow FeBr_4^{\ominus}$

→ Neutral Electrophile



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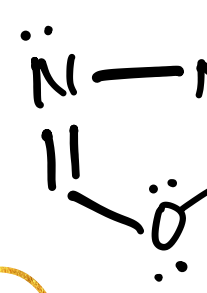
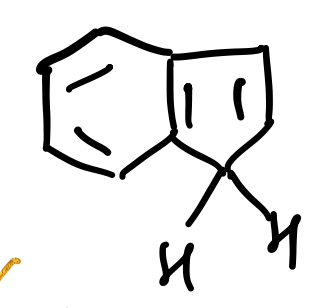
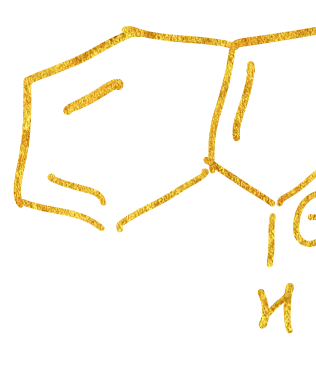


6πe⁻ Aro

31)


is acidic. why?

Indene

−H⁺


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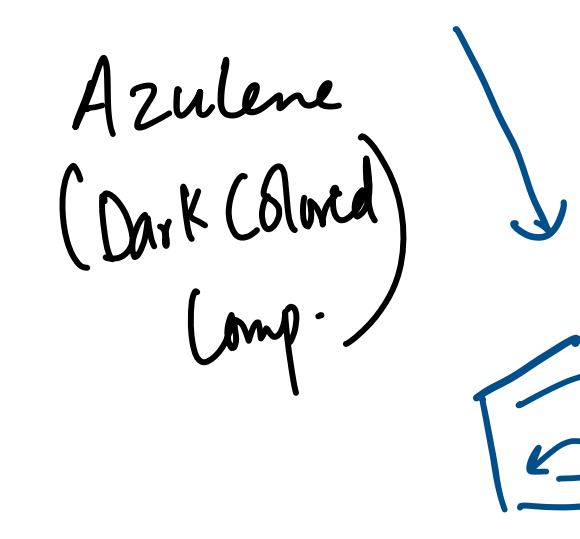
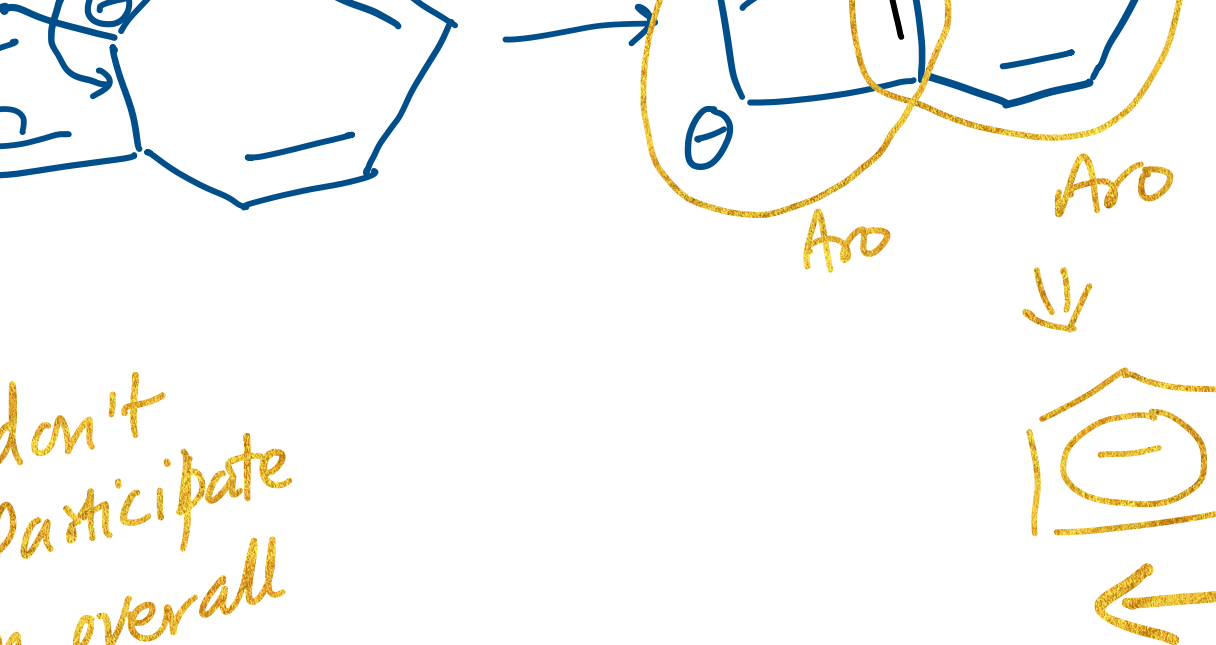


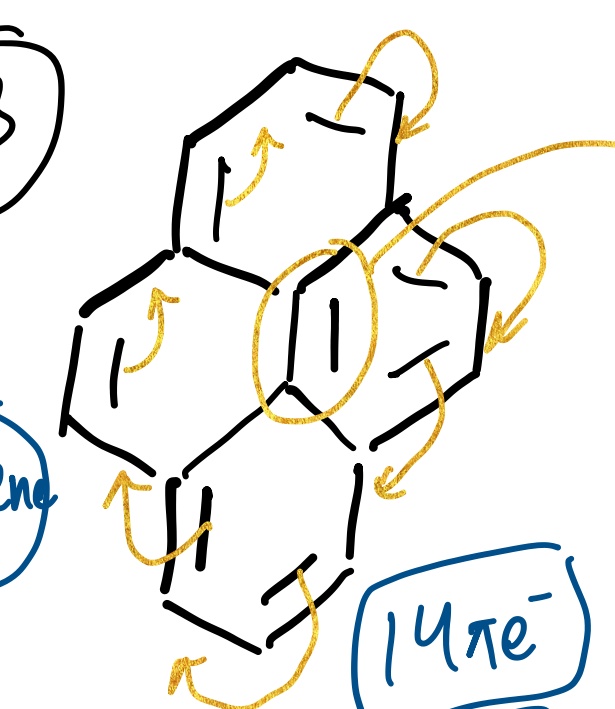
⇒ It has permanent Dipole.

Azulene (Dark Colored Comp.)



charge seperation favourable

R.E is High

33)


don't participate in overall delocalisation so, don't count for Aromaticity.

14πe⁻ Aro

e⁻ density delocalise on surface

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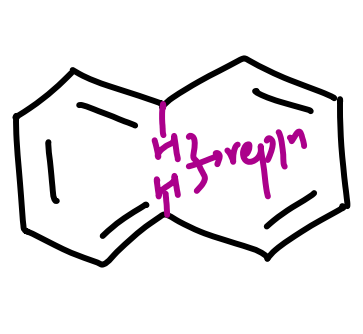
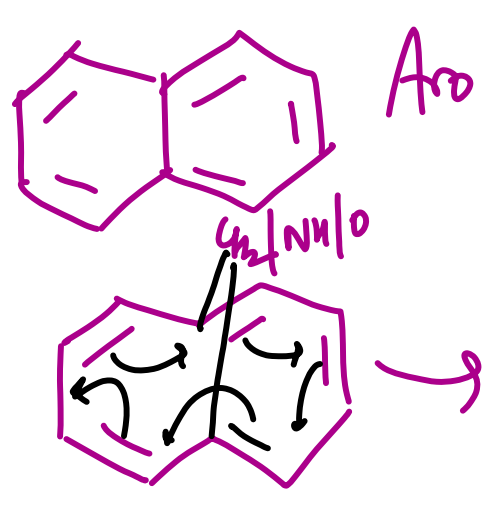


[10]-Annulene

$C_{10}H_{10}$ 10πe⁻ → Shud be Aro but it is not Aromatic due to non-planar str. → to avoid flagpole repulsion



Q |R.E|